UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

July 22, 1996

James Shafer, Remedial Project Manager
U.S. Department of the Navy
Naval Facilities Engineering Command
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Re Field Modification Request for the Derecktor Shipyard Well Development: Technical Review of "FMR# W5259091F-03, Proposed Well Development Procedure, Former Derecktor Shipyard, NETC Newport, RI, On-Shore Site Assessment Screening Evaluation" (July 17, 1996)

Dear Mr Shafer

Thank you for the opportunity to review the *Field Modification Request ("FMR") for the Derecktor Shipyard Well Development.* In general, the FMR lacks specificity and therefore makes it difficult to review the well development scheme. It is unclear whether the plan provided is intended to be a blueprint solely for "well development procedure," as the title indicates, or if the procedure also pertains to the subsequent purging and sampling phase. The following EPA comments assume that this protocol refers *only* to well development, and that purging and sampling will require a separate SOP. I am enclosing *US EPA Region 1 Low Flow (minimum stress) Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells; Revision No. 1 DRAFT, May 13, 1996* to assist you in developing a purging/sampling SOP

Better defined objectives are needed for this procedure For example, the goal of this and other tasks leading to groundwater sample collection is to enable collection of "representative" samples. Removal of bias created by artificially-induced turbidity is critical to this overall goal. A specific objective of this procedure should be to determine the optimal extraction rates to be used during the subsequent purging and sampling phase to obtain turbid-free samples with minimal stress and rapid stabilization of field indicators Once established, the pumping rates, dial settings, or any other pertinent information should be recorded and made available for sampling plan design and execution In general, sampling should be conducted at a lower extraction rate than that used for the more aggressive development process

EPA concurs with the approach described in paragraphs 1 and 2 to insure the adequate installation of the filter pack. However, the Navy should also address the other issues discussed at the May 29, 1996 Maine DEP Low Flow Sampling Conference. In particular, discuss how

determinations will be made to insure that the filter pack and screen materials are of *optimum size* for the aquifer materials in question Sieve testing of geologic materials at the proposed screened interval must be conducted.

Please provide the criteria that will be used to determine adequacy of development (*i.e.*, completion criteria) to the last sentence of paragraph 2.

Although generally adequate for development purposes, the list of water quality parameters provided in paragraph 3 lacks several (*e.g.*, DO, ORP) that should be added during the purging and sampling phase Stabilization criteria will also have to be modified at this juncture (*see* enclosed procedure for more detail).

EPA agrees that quantities of water extracted from the well during development and amounts added during the drilling process should be compared (*see* paragraph 4). However, EPA recommends that 8 hours be used as a termination criteria instead of 4 hours, particularly in cases where a demonstrable trend of improvement with time is indicated by the water quality parameters.

I look forward to working with you on this issue Please do not hesitate to contact me at (617) 573-5777 should you have any questions or wish to arrange a meeting.

Sincerely,

Kymberlee Keckler, Remedial Project Manager
Federal Facilities Superfund Section

Attachment

cc: Paul Kulpa, RIDEM, Providence, RI
Brad Wheeler, NETC, Newport, RI
Mary Pothier, CDM, Cambridge, MA
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LOW FLOW (minimum stress) PURGING AND SAMPLING PROCEDURE FOR THE COLLECTION OF GROUND WATER SAMPLES FROM MONITORING WELLS

I. SCOPE & APPLICATION

The purpose of this standard operating procedure (SOP) is to provide a general framework for the collection of ground water samples that are indicative of mobile organic and inorganic loads at ambient flow conditions (both the dissolved fraction and the fraction associated with mobile particulates). The SOP emphasizes the need to minimize water-level drawdown, and low pumping rates in order to collect samples with minimal alterations to water chemistry. Samples thus obtained are suitable for analyses of ground-water contaminants (volatile and semi-volatile organic analytes, pesticides, PCBs, metals and other inorganics), or other naturally occurring analytes. This procedure does not address the collection of samples from wells containing light or dense non-aqueous phase liquids (LNAPLs and DNAPLs).

This SOP is aimed primarily at sampling monitoring wells that can accept a submersible pump and have a screen, or open interval length of 10 feet or less (this is the most common situation). Yet, the minimum stress procedure is flexible and can be used in a variety of well construction and ground-water yield situations. It is presumed that the screen, or open interval is optimally located (both laterally and vertically) to intercept existing contaminant plume(s) or along flowpaths of potential contaminant releases, and that the analytes of interest move (or potentially move) primarily through the more permeable zones within the screen, or open interval.

Proper well construction and development cannot be overemphasized, since the use of installation techniques that are appropriate to the hydrogeologic setting should prevent "problem well" situations from occurring. It is also recommended that after development or redevelopment the well should be tested to determine the optimum pumping rate to obtain stabilization of field indicator parameters with minimal drawdown in shortest amount of time. With this information field crews can then conduct purging and sampling in a more expeditious manner.

Use of trademarked names does not imply endorsement by U.S.EPA but is intended only to assist in identification of a specific type of device.

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The mid-point of the saturated screen length (which should not exceed 10 feet) is used by convention as the location of the pump intake. However, significant chemical or permeability contrast(s) within the screened zone may require additional field work to systematically determine the optimum vertical location(s) for the intake. This is especially important for long screens in unconsolidated materials and for geologic units where ground-water movement takes place primarily along secondary permeability features.

Stabilization of indicator field parameters is used to indicate conditions are suitable to commence sampling. Achievement of turbidity levels of less than 5 NTU and stable drawdowns of less than 0.3 feet, while desirable, are not mandatory. Sample collection can take place provided the remaining criteria in this procedure are met. If after 4 hours of purging the indicator field parameters have not stabilized, one of 3 optional courses of action may be taken: a) continue purging until stabilization is achieved, b) discontinue purging, do not collect any samples, record in log book that stabilization could not be achieved (this is not the preferred option, and if elected a full explanation must be documented, this may also necessitate redevelopment or redrilling of well), c) discontinue purging and collect samples (selection of this option incurs a risk that the analytical data obtained, especially metals and strongly hydrophobic organic analytes, may not meet the sampling objectives).

Changes to this SOP should be proposed and discussed when the site sampling and analysis plan is submitted for approval. Subsequent requests for modifications of an approved plan must include adequate technical justification for proposed changes. All changes and modifications must be approved before implementation in field.

II. EQUIPMENT

▸Extraction device

Adjustable rate, submersible pumps are preferred (e.g., centrifugal or bladder pump constructed of stainless steel or Teflon).

Adjustable rate, peristaltic pumps (suction) may be used with caution. Note that EPA guidance states: "Suction pumps are not recommended because they may cause degassing, pH modification, and loss of volatile compounds" (EPA/540/P-87/001, 1987, page 8.5-11).

The use of inertial pumps is discouraged. This device frequently causes greater disturbance during purging and sampling and is less

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easily controlled than the pumps listed above. This can lead to sampling results that are adversely effected by purging and sampling operations, and a high degree of data variability.

Tubing - Teflon or Teflon lined polyethylene tubing are preferred when sampling is to include VOCs, SVOCs, pesticides, PCBs and inorganics.

In addition to the above, PVC, Tygon, polypropylene or polyethylene tubing may be used when collecting samples for inorganics analyses.

The use of 1/4 inch or 3/8 inch (inner diameter) tubing is preferred. This will help ensure the tubing remains liquid filled when operating at very low pumping rates.

Stainless steel tubing may be used when sampling for VOCs, SVOCs, pesticides, and PCBs. However, it should be used with caution when sampling for metals.

Pharmaceutical grade (Pharmed) tubing should be used for the section around the rotor head when using a peristaltic pump, to minimize gaseous diffusion.

▸Water level measuring device, capable of measuring to 0.01 foot accuracy, (electronic devices are preferred for tracking water level drawdown during all pumping operations).

▸Flow measurement supplies (e.g., graduated cylinder and stop watch).

▸Interface probe, if needed.

▸Power source (generator, nitrogen tank, etc.). If a gasoline generator is used, it must be located downwind and at least 30 feet from the well so that the exhaust fumes do not contaminate the samples.

▸Indicator field parameter monitoring instruments - pH, Eh, dissolved oxygen (DO), turbidity, specific conductance, and temperature. Use of a flow-through-cell is required when measuring all listed parameters, except turbidity. Standards to perform field calibration of instruments. Analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846. For Eh measurements, follow manufacture's instructions.

▸Decontamination supplies (e.g. non-phosphate detergent, distilled/deionized water, isopropyl alcohol, etc.).

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▸Logbook(s), and other forms (e.g., well purging forms).

▸Sample Bottles.

▸Sample preservation supplies (as required by the analytical methods).

▸Sample tags or labels.

▸Well construction data, location map, field data from last sampling event and well keys.

▸Field Sampling Plan.

▸PID or FID instrument (if appropriate) to detect VOCs for health and safety purposes, and provide qualitative field evaluations.

III. PRELIMINARY SITE ACTIVITIES

▸Check well for security damage or evidence of tampering, record pertinent observations.

▸Lay out sheet of clean polyethylene for monitoring and sampling equipment.

▸Remove well cap and immediately measure VOCs at the rim of the well with a PID or FID instrument and record the reading in the field logbook.

▸If the well casing does not have a reference point (usually a V-cut or indelible mark in the well casing), make one. Record the date of the mark in the logbook.

▸A synoptic water level measurement round should be performed (in the shortest possible time) before any purging and sampling activities begin. It is recommended that water level depth (to 0.01 ft.) and total well depth (to 0.1 ft.) be measured the day before, in order to allow for re-settlement of any particulates in the water column. All measurements must be taken from the established referenced point. Care should be taken to minimize water column disturbance.

▸Check newly constructed wells for the presence of LNAPLs or DNAPLs before the initial sampling round. Subsequent check measurements with an interface probe are usually not needed unless analytical data or field head space information signal a worsening situation. Note collection of LNAPL and DNAPL samples is not addressed in this SOP.

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IV. PURGING AND SAMPLING PROCEDURE

Sample wells in order of increasing chemical concentrations.

Use of a submersible pump to purge and sample monitoring wells is preferred.

Lower pump, safety cable, tubing and electrical lines slowly into the well to minimize disturbance and to a depth such that the pump intake is located at the midpoint of the zone to be sampled. If possible keep the pump intake at least two feet above the bottom of the well, to minimize mobilization of particulates that may be present in the bottom of the well. Collection of turbid free water samples may be difficult if there is two feet or less of standing water in the well.

Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no water level drawdown (less than 0.3 feet). If the minimal drawdown that can be achieved exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize. Subsequent sampling rounds should have intake depths and extraction rates that are comparable to those used in the initial sampling round.

Monitor and record water level and pumping rate every three to five minutes (or as appropriate) during purging. Record any pumping rate adjustments. Pumping rates should, as needed, be reduced to the minimum capabilities of the pump (e.g., 0.1 - 0.4 l/min) to ensure stabilization of indicator parameters. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. During initial pump start-up, drawdown may exceed the 0.3 feet target and then "recover" as pump flow adjustments are made. Purge volume calculations should utilize stabilized drawdown values, not the initial drawdown. Do not allow the water level to fall to the intake level (if the static water level is above the well screen, avoid lowering the water level into the screen). The final purge volume must be greater than the stabilized drawdown volume plus the tubing extraction volume.

Wells with low recharge rates may require the use of special pumps capable of attaining very low pumping rates (bladder, peristaltic), and/or the use of dedicated equipment. If the recharge rate of the well is lower than extraction rate capabilities of currently manufactured pumps and the well is essentially dewatered during purging, then the well should be sampled as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples. Samples may be collected even though

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the indicator field parameters were not able to be monitored for stabilization.

During well purging, monitor field indicator parameters (turbidity, temperature, specific conductance, pH, Eh, DO) every three to five minutes (or as appropriate). Purging is considered complete and sampling may begin when all the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:

turbidity (10% for values greater than 1 NTU),
DO (10%),
specific conductance (3%),
temperature (3%),
pH (± 0.1 unit),
Eh (± 10 millivolts).

Parameter values should also not exhibit a trend (either slowly increasing or decreasing). All measurements, except turbidity, must be obtained using a flow-through-cell. Water samples for laboratory analyses must not be collected after water has passed through the flow-through-cell (use a by-pass assembly or disconnect cell to obtain sample).

The flow-through-cell must be designed in a way that prevents air bubble entrapment in the cell. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must be submerged in water at all times. If two flow-through-cells are used in series, the one containing dissolved oxygen probe should come first (this parameter is most susceptible to error if air leaks into the system).

VOC samples are preferably collected first and directly into pre-preserved sample containers. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

During purging and sampling, the tubing should remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. It is recommended that 1/4 inch or 3/8 inch (inside diameter) tubing be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, use one of the following procedures to collect samples: (1) add clamp, connector (Teflon or stainless steel) or valve to constrict sampling end of tubing; (2) insert small diameter Teflon tubing into water filled portion of pump tubing

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allowing the end to protrude beyond the end of the pump tubing, collect sample from small diameter tubing; (3) collect non-VOC samples first, then increase flow rate slightly until the water completely fills the tubing, collect sample and record new drawdown, flow rate and new indicator field parameter values.

Add preservative, as required, to samples immediately after they are collected if the sample containers are not pre-preserved. Check analytical methods (e.g. EPA SW-846, water supply, etc.) for additional information on preservation. Check pH for all samples requiring pH adjustment to assure proper pH value. For VOC samples, this will require that a test sample be collected during purging to determine the amount of preservative that needs to be added to the sample containers prior to sampling.

If filtered metal concentrations are desired, collect filtered water samples using the same low flow procedures. The use of an in-line filter is required, and the filter size (0.45 um is commonly used) should be based on the sampling objective. Pre-rinse the filter with approximately 25 - 50 ml of groundwater prior to sample collection. Preserve filtered water sample immediately. Note that filtered water samples are not an acceptable substitute for unfiltered samples when the monitoring objective is to obtain total chemical concentrations for human health risk calculations.

Label each sample as collected. Samples requiring cooling (volatile organics, cyanide, etc.) will be placed into a cooler with ice or refrigerant for delivery to the laboratory. Metal samples after acidification to a pH less than 2 do not need to be cooled.

After collection of the samples, the pump tubing may either be dedicated to the well for resampling (by hanging the tubing inside the well), decontaminated, or properly discarded.

Before securing the well, measure and record the well depth (to 0.1 ft.), if not measured the day before purging began.

Secure the well.

V. DECONTAMINATION

Decontaminate sampling equipment prior to use in the first well and following sampling of each subsequent well. Pumps will not be removed between purging and sampling operations. The pump and tubing (including support cable and electrical wires which are in contact with the well) will be decontaminated by one of the procedures listed below.

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Procedure 1

▸The decontaminating solutions can be pumped from either buckets or short PVC casing sections through the pump or the pump can be disassembled and flushed with the decontaminating solutions. It is recommended that detergent and isopropyl alcohol be used sparingly in the decontamination process and water flushing steps be extended to ensure that any sediment trapped in the pump is removed. The pump exterior and electrical wires must be rinsed with the decontaminating solutions, as well. The procedure is as follows:

▸Flush the equipment/pump with potable water.

▸Flush with non-phosphate detergent solution. If the solution is recycled, the solution must be changed periodically.

▸Flush with potable or distilled/deionized water to remove all of the detergent solution. If the water is recycled, the water must be changed periodically.

▸Flush with isopropyl alcohol (pesticide grade). If equipment blank data from the previous sampling event show that the level of contaminants is insignificant, then this step may be skipped.

▸Flush with distilled/deionized water. The final water rinse must not be recycled.

Procedure 2

▸Steam clean the outside of the submersible pump.

▸Pump hot potable water from the steam cleaner through the inside of the pump. This can be accomplished by placing the pump inside a three or four inch diameter PVC pipe with end cap. Hot water from the steam cleaner jet will be directed inside the PVC pipe and the pump exterior will be cleaned. The hot water from the steam cleaner will then be pumped from the PVC pipe through the pump and collected into another container. Note: additives or solutions should not be added to the steam cleaner.

▸Pump non-phosphate detergent solution through the inside of the pump. If the solution is recycled, the solution must be changed periodically.

▸Pump potable water through the inside of the pump to remove all of the detergent solution. If the solution is recycled, the solution must be changed periodically.

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▸Pump distilled/deionized water through the pump. The final water rinse must not be recycled.

VI.FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not compromised the quality of the ground water samples. All field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation. The following quality control samples shall be collected for each batch of samples (a batch may not exceed 20 samples). Trip blanks are required for the VOC samples at a frequency of one set per VOC sample cooler.

▸Field duplicate.

▸Matrix spike.

▸Matrix spike duplicate.

▸Equipment blank.

▸Trip blank (VOCs).

▸Temperature blank (one per sample cooler).

Equipment blank shall include the pump and the pump's tubing. If tubing is dedicated to the well, the equipment blank will only include the pump in subsequent sampling rounds.

Collect samples in order from wells with lowest contaminant concentration to highest concentration. Collect equipment blanks after sampling from contaminated wells and not after background wells.

Field duplicates are collected to determine precision of sampling procedure. For this procedure, collect duplicate for each analyte group in consecutive order (VOC original, VOC duplicate, SVOC original, SVOC duplicate, etc.).

If split samples are to be collected, collect split for each analyte group in consecutive order (VOC original, VOC split, etc.). Split sample should be as identical as possible to original sample.

All monitoring instrumentation shall be operated in accordance with EPA analytical methods and manufacture's operating instructions. EPA

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analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846 with exception of Eh, for which the manufacture's instructions are to be followed. Instruments shall be calibrated at the beginning of each day. If a measurement falls outside the calibration range, the instrument should be re-calibrated so that all measurements fall within the calibration range. At the end of each day, check calibration to verify that instruments remained in calibration. Temperature measuring equipment, thermometers and thermistors, need not be calibrated to the above frequency. They should be checked for accuracy prior to field use according to EPA Methods and the manufacturer's instructions.

VII.FIELD LOGBOOK

A field log shall be kept to document all ground water field monitoring activities. The field logbook should document the following:

- Well identification.
- Well depth, and measurement technique.
- Static water level depth, date, time and measurement technique.
- Presence and thickness of immiscible liquid layers and detection method.
- Pumping rate, drawdown, indicator parameters values, and clock time, at the appropriate time intervals; calculated or measured total volume pumped.
- Well sampling sequence and time of each sample collection.
- Types of sample bottles used and sample identification numbers.
- Preservatives used.
- Parameters requested for analysis.
- Field observations during sampling event.
- Name of sample collector(s).
- Weather conditions.
- QA/QC data for field instruments.

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- Any problems encountered should be highlighted.

- Description of all sampling equipment used, including trade names, model number, diameters, material composition, etc.

VIII. DATA REPORT

Data reports are to include analytical results, QA/QC information, and field logbook information needed to allow full evaluation of data useability.